

Table 1. Lake Ontario phytoplankton and zooplankton sampling dates, 1986 to 1992.

1986	Stations	1987	Stations	1988	Stations
	Sampled		Sampled		Sampled
4/20 - 4/21	8	4/21	8	4/11 - 4/12	8
4/24 - 4/25	8	4/23 - 4/24	8	4/13	8
8/9 - 8/10	8	8/2 - 8/3	8	8/14	8
8/12 - 8/13	8	8/14 - 8/15	8	8/16	8

1989	Stations	1990	Stations	1991	Stations
	Sampled		Sampled		Sampled
8/15 - 8/16	8	4/13	8	4/8 - 4/9	8
8/17 - 8/18	8	4/14 - 4/15	8	4/11 - 4/13	8
		8/11 - 8/12	8	8/10 - 8/11	8
		8/13 - 8/14	8	8/12 - 8/13	8

1992	Stations
	Sampled
4/5 - 4/6	8

Table 2. Number of species observed in each algal division or grouping, Lake Ontario, 1986 to 1992. Spring and summer data only.
 BAC=Bacillariophyta, CHL=Chlorophyta, CHR=Chrysophyta, COL - colorless flagellates, CRY=Cryptophyta, CYA=Cyanophyta,
 EUG = Euglenophyta, PYR=Pyrrophyta, UNI = unidentified flagellates.

NUMBER OF SPECIES							
	1986	1987	1988	1989	1990	1991	1992
BAC	79	70	65	50	56	72	25
CHL	40	43	28	44	43	51	16
CHR	14	24	20	26	27	18	10
COL	5	2	2	1	2	2	5
CRY	15	17	11	10	16	17	15
CYA	6	7	4	13	11	9	5
EUG	1	0	0	1	2	0	0
PYR	7	3	4	6	5	5	3
UNI	1	0	1	0	0	0	2
TOTAL	168	166	135	151	162	174	76
							379

Table 3. Number of genera observed in each algal division or grouping, Lake Ontario, 1986 to 1992. Spring and summer data only.
 BAC=Bacillariophyta, CHL=Chlorophyta, CHR=Chrysophyta, COL - colorless flagellates, CRY=Cryptophyta, CYA=Cyanophyta,
 EUG = Euglenophyta, and PYR=Pyrrophyta.

	NUMBER OF GENERA							
	1986	1987	1988	1989	1990	1991	1992	1986-92
BAC	20	20	19	18	17	21	12	27
CHL	19	17	16	22	20	27	10	38
CHR	8	10	11	12	15	11	9	21
COL	3	2	2	1	2	2	2	5
CRY	2	3	3	3	2	2	2	3
CYA	4	5	3	8	8	7	4	11
EUG	1	0	0	1	2	0	0	2
PYR	5	2	3	4	4	3	3	6
TOTAL	62	59	57	69	70	73	42	113

Table 4. Summary of common phytoplankton species occurrence in Lake Ontario, 1986 to 1992. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance $\geq 0.5\%$ of the total cells or $\geq 0.5\%$ of the total biovolume.

TAXON	MAXIMUM CELLS/EL	AVERAGE % OF TOTAL CELLS/EL	AVERAGE % OF TOTAL CELLS	MEAN BIOVOLUME $\mu\text{m}^3/\text{mL}$	MEAN % OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
<i>Actinocyclus normanii</i>	201	1.3	0.03	3,766	0.64
<i>Asterionella formosa</i>	224	11.0	0.27	3,468	0.58
<i>Aulacoseira islandica</i>	1095	105.3	2.58	95,277	16.07
<i>Cymatopleura solea</i>	3	0.1	0.00	3,188	0.54
<i>Fragilaria crotonensis</i>	262	30.8	0.75	19,053	3.21
<i>Nitzschia lauenburgiana</i>	17	1.1	0.03	6,667	1.12
<i>Stephanodiscus alpinus</i>	131	7.0	0.17	32,287	5.45
<i>Stephanodiscus binderanus</i>	1426	33.0	0.81	14,981	2.53
<i>Stephanodiscus niagarae</i>	22	0.9	0.02	14,166	2.39
<i>Tabellaria flocculosa</i>	157	12.3	0.30	22,473	3.79
Total			4.96		36.31
CHLOROPHYTA					
<i>Chlamydomonas</i> sp.	229	25.1	0.61	1,694	0.29
<i>Gloeocystis</i> sp.	720	35.4	0.87	1,912	0.32
<i>Green coccoid</i>	9254	409.6	10.02	25,193	4.25
<i>Oocystis borgei</i>	205	11.2	0.27	4,091	0.69
<i>Oocystis parva</i>	2602	28.7	0.70	2,311	0.39
<i>Oocystis pusilla</i>	409	44.6	1.09	3,884	0.66
<i>Oocystis solitaria</i>	147	5.5	0.13	3,805	0.64
<i>Pediastrum duplex</i>	655	4.1	0.10	13,736	2.32
<i>Scenedesmus bijuga</i>	998	60.6	1.48	4,621	0.78
<i>Scenedesmus ecornis</i>	2323	51.1	1.25	2,399	0.40
<i>Sphaerocystis schroeteri</i>	2553	75.5	1.85	4,778	0.81
<i>Staurastrum</i> sp.	8	0.2	0.00	18,264	3.08
<i>Tetraedron minimum</i>	205	9.8	0.24	4,455	0.75
Total			18.62		15.37
CHRYSOPHYTA					
<i>Chromulina</i> sp.	213	50.3	1.23	5,771	0.97
<i>Haptophyceae</i>	2143	338.6	8.28	7,525	1.27
<i>Ochromonas</i> sp.	573	115.7	2.83	13,631	2.30
Total			12.34		4.54
COLORLESS FLAGELLATES					
<i>Colorless flagellate</i>	2470	43.3	1.06	2,011	0.34
CRYPTOPHYTA					
<i>Cryptomonas erosa</i>	245	31.0	0.76	57,503	9.70
<i>Cryptomonas marssonii</i>	90	11.3	0.28	8,358	1.41
<i>Cryptomonas ovata</i>	98	5.2	0.13	7,801	1.32
<i>Cryptomonas phaseolus</i>	90	9.5	0.23	4,062	0.69
<i>Cryptomonas pyrenoidifera</i>	65	6.6	0.16	5,238	0.88
<i>Rhodomonas minuta</i>	2798	286.7	7.01	20,028	3.38
Total			8.57		17.37
CYANOPHYTA					
<i>Anacystis montana</i>	26916	1,470.1	35.96	14,433	2.43
<i>Chroococcus</i> sp.	475	22.5	0.55	899	0.15
<i>Oscillatoria limnetica</i>	6496	197.8	4.84	2,716	0.46
<i>Oscillatoria</i> sp.	1014	70.2	1.72	1,628	0.27
<i>Synechococcus</i> sp.	4582	87.2	2.13	4,526	0.76
Total			45.20		4.08
PYRROPHYTA					
<i>Ceratium hirundinella</i>	33	0.7	0.02	17,089	2.88
<i>Gymnodinium helveticum</i>	16	0.4	0.01	4,061	0.68
<i>Gymnodinium</i> sp.	41	6.2	0.15	14,176	2.39
<i>Peridinium</i> sp.	57	5.1	0.13	25,058	4.23
Total			0.31		10.18
Total			=====		=====
			91.06		88.20

Table 5. Time trends in spring phytoplankton abundance and biomass for Lake Ontario, 1986 to 1992. NS = no sample. BAC = Bacillariophyta, CHL = Chlorophyta, CHR = Chrysophyta, CYA = Cyanophyta, PYR = Pyrophyta and CRY = Cryptophyta.
(*) Mean biomass and abundances for all divisions.

Spring Abundance (Cells/ml)														
	BAC	%	CHL	%	CHR	%	CYA	%	PYR	%	CRY	%	%	Mean*
1986	65	3.5	134	7.2	433	23.4	991	53.5	13	0.7	178	9.6	1854	
1987	507	29.8	175	10.3	167	9.8	700	41.1	13	0.8	125	7.4	1702	
1988	217	11.2	156	8.1	213	11.0	1020	52.9	15	0.8	270	14.0	1928	
1989	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1990	642	19.6	142	4.3	478	14.6	1562	47.6	20	0.6	251	7.7	3281	
1991	284	12.3	272	11.8	386	16.8	1053	45.7	13	0.6	276	12.0	2303	
1992	841	21.0	253	6.3	526	13.1	1954	48.9	23	0.6	356	8.9	4001	
Mean	426	16.2	189	8.0	367	14.8	1213	48.3	16	0.7	243	9.9	2512	

Spring Biomass (g/m ³)														
	BAC	%	CHL	%	CHR	%	CYA	%	PYR	%	CRY	%	%	Mean*
1986	0.173	58.7	0.010	3.3	0.022	7.6	0.007	2.4	0.033	11.1	0.049	16.5	0.295	
1987	0.407	72.2	0.009	1.6	0.008	1.4	0.006	1.1	0.083	14.7	0.051	9.0	0.564	
1988	0.185	53.1	0.015	4.3	0.010	2.9	0.009	2.6	0.042	12.1	0.087	24.8	0.349	
1989	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1990	0.638	57.9	0.218	19.7	0.036	3.2	0.035	3.2	0.079	7.1	0.082	7.5	1.103	
1991	0.250	58.4	0.018	4.2	0.026	6.2	0.015	3.5	0.020	4.7	0.098	22.9	0.428	
1992	0.737	72.8	0.018	1.8	0.045	4.5	0.024	2.3	0.041	4.1	0.145	14.4	1.011	
Mean	0.398	62.2	0.048	5.8	0.025	4.3	0.016	2.5	0.050	9	0.085	15.9	0.625	

Table 6. Time trends in summer phytoplankton abundance and biomass for Lake Ontario, 1986 to 1992. NS = no sample. BAC = Bacillariophyta, CHL = Chlorophyta, CHR = Chrysophyta, CYA = Cyanophyta, PYR = Pyrrophyta and CRY = Cryptophyta.
(*) Mean biomass and abundances for all divisions.

Summer Abundance (Cells/ml)													
	BAC	%	CHL	%	CHR	%	CYA	%	PYR	%	CRY	%	Mean*
1986	141	3.3	1176	27.7	760	17.9	1367	32.2	10	0.2	737	17.3	4251
1987	97	1.7	2941	50.2	430	7.3	2011	34.3	1	0.0	358	6.1	5862
1988	258	2.4	1540	14.1	1239	11.4	7315	67.2	12	0.1	505	4.6	10890
1989	83	1.7	1065	22.1	673	14.0	2442	50.7	20	0.4	505	10.5	4816
1990	119	2.8	1121	26.2	709	16.6	1743	40.8	22	0.5	481	11.3	4274
1991	143	3.7	1194	31.0	968	25.1	899	23.3	7	0.2	595	15.5	3851
1992	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mean	140	2.6	1506	28.6	796	15.4	2629	41.4	12	0.2	530	10.9	5657

Summer Biomass (g/m ³)													
	BAC	%	CHL	%	CHR	%	CYA	%	PYR	%	CRY	%	Mean*
1986	0.138	22.9	0.127	21.0	0.025	4.1	0.016	2.7	0.086	14.2	0.211	34.8	0.606
1987	0.053	14.0	0.215	56.9	0.012	3.2	0.021	5.6	0.000	0.1	0.076	20.2	0.379
1988	0.239	35.4	0.101	14.9	0.048	7.2	0.086	12.8	0.100	14.8	0.099	14.7	0.675
1989	0.020	2.5	0.272	33.3	0.064	7.8	0.077	9.5	0.182	22.4	0.196	24.0	0.816
1990	0.080	14.5	0.143	25.9	0.060	10.9	0.050	9.1	0.074	13.4	0.140	25.4	0.552
1991	0.104	18.9	0.146	26.5	0.068	12.4	0.020	3.7	0.038	6.9	0.172	31.4	0.550
1992	NS	NS	NS										
Mean	0.106	18.0	0.167	29.8	0.046	7.6	0.045	7.2	0.080	12.0	0.149	25.1	0.596

Table 7. Relative biomass (% of total biomass) of algal divisions in 1972/73, 1981, 1982 and 1986- 1992, Lake Ontario. Only April or May and August data are considered, except for the combined spring and summer data from Munawar *et al.* (1974). Data are from Munawar *et al.* (1974), Stoermer and Ladewski (1978), Johansson *et al.* (1985b) and this study. Because spring and summer samples were not collected, data are not provided for 1989 and 1992

	BAC	CHL	CHR	CRY	CYA	PYR
1972/73*	61	10	0	2	2	21
1972/73**	32	7	5	19	2	31
1981	43	6	0	26	2	23
1982	15	19	1	38	7	19
1986	35	15	2	29	3	13
1987	49	24	1	14	3	9
1988	42	11	6	18	9	14
1990	43	22	6	14	5	9
1991	36	17	10	28	4	6

* Stoermer and Ladewski (1978)

** Munawar *et al.* (1974)

Table 8. Average abundance and biomass (\pm standard error) for the spring and summer period from 1986 to 1992, Lake Ontario. Average is the weighted average for the number of cruises per season. NS indicates that no samples were taken during that season.

YEAR	SPRING	SUMMER		AVERAGE	
		cells/ml	g/m ³	cells/ml	g/m ³
1986	1824 \pm 216	0.30 \pm 0.07	4251 \pm 708	0.60 \pm 0.07	3052 \pm 423 0.45 \pm 0.06
1987	1702 \pm 378	0.56 \pm 0.19	5 8 6 2 2 6 3 8	0.38 \pm 0.04	3782 \pm 522 0.47 \pm 0.10
1988	1928 \pm 156	0.35 \pm 0.04	10890 \pm 2357	0.68 \pm 0.11	6409 \pm 1413 0.51 \pm 0.06
1989	NS	NS	4816 \pm 944	0.82 \pm 0.19	4816 5944 0.82 \pm 0.19
1990	3281 \pm 468	1.10 \pm 0.24	4274 \pm 458	0.55 \pm 0.06	3777 \pm 334 0.83 \pm 0.13
1991	2303 \pm 241	0.43 \pm 0.05	3851 \pm 264	0.55 \pm 0.04	3077 \pm 224 0.49 \pm 0.04
1992	4001 \pm 420	1.01 \pm 0.17	NS	NS	4001 \pm 420 1.01 \pm 0.17
MEAN	2788 \pm 225	0.64 \pm 0.07	5506 \pm 544	0.54 \pm 0.03	4088 \pm 302 0.59 \pm 0.04

Table 9. Summary of common phytoplankton species from Lake Ontario during 1981.
 Summary includes the average population biomass and the percent of total biomass for April and August offshore sites only. Common species were arbitrarily defined as contributing 5% of the algal biomass to any sample during the year. Data from Johannsson et al. 1985.

TAXON	MEAN BIOMASS gm/m ³	% OF TOTAL BIOMASS
BACILLARIOPHYCEAE		
<i>Asteronella formosa</i>	3.1	0.37
<i>Diatoma elongata</i>	4.1	0.06
<i>Cyclotella</i> sp.	8.5	1.02
<i>Melosira binderana</i>	79.6	9.53
<i>Melosira islandica</i>	83.0	9.94
<i>Fragilaria crotonensis</i>	1.0	0.12
<i>Nitzschia acicularis</i>	1.7	0.20
<i>Stephanodiscus astraea v. minutula</i>	64.2	7.69
<i>Stephanodiscus hantzschii</i>	6.9	0.83
<i>Stephanodiscus niagarae</i>	18.3	2.19
<i>Cymatopleura solea</i>	1.1	0.13
<i>Tabellaria fenestrata</i>	8.7	1.04
<i>Synedra ulna</i>	53.8	6.44
<i>Synedra acus</i>	0.7	0.08
Total		39.64
CHLOROPHYCEAE		
<i>Pediastrum simplex v. duodenarium</i>	0.5	0.06
<i>Pediastrum duplex v. clathratum</i>	4.9	0.59
<i>Scenedesmus ecornis</i>	1.2	0.15
<i>Staurastrum paradoxum v. parvum</i>	6.7	0.81
<i>Ulothrix variabilis</i>	0.4	0.05
<i>Mougeotia</i> sp.	1.8	0.22
<i>Sphaerocystis schroeteri</i>	2.9	0.34
<i>Coelastrum microporum</i>	1.2	0.14
<i>Oocystis borgei</i>	5.8	0.69
Total		3.05
CYANOPHYCEAE		
<i>Oscillatoria limnetica</i>	0.2	0.02
<i>Anabaena</i> sp.	14.8	1.71
Total		1.79
CRYPTOPHYCEAE		
<i>Cryptomonas erosa</i>	123.5	14.80
<i>Rhodomonas minuta</i>	45.4	5.44
<i>Katablepharis ovalis</i>	1.4	0.16
Total		20.40
DINOPHYCEAE		
<i>Gymnodinium helveticum</i>	37.4	4.41
<i>Gymnodinium uberrimum</i>	23.8	2.85
<i>Peridinium cinctum</i>	6.6	0.79
<i>Peridinium aciculiferum</i>	73.5	8.80
<i>Glenodinium</i> sp.	11.7	1.40
<i>Ceratium hirundinella</i>	15.0	1.80
Total		20.12
Total		85.00

Table 10. Summary of common phytoplankton species from Lake Ontario during 1982. Summary includes the average population biomass and the percent of total biomass for April and August offshore sites only. Common species were arbitrarily defined as contributing 5% of the algal biomass to any sample during the year. The data is from Johannsson *et al.* 1985.

Taxon	Mean Biomass gm/m ³	% of Total Biomass
BACILLARIOPHYCEAE		
<i>Fragilaria capucina</i>	2.0	0.43
<i>Fragilaria crotensis</i>	6.4	1.36
<i>Tabellaria fenestrata</i>	5.9	1.28
<i>Nitzschia linearis</i>	3.9	0.84
<i>Melosira islandica</i>	22.1	4.16
<i>Melosira binderana</i>	3.5	0.76
<i>Diatoma elongata</i>	3.2	0.69
<i>Stephanodiscus astraea v. minutula</i>	0.7	0.15
<i>Stephanodiscus hantzschii</i>	1.8	0.25
<i>Synedra ulna</i>	5.1	1.10
Total		11.67
CHLOROPHYCEAE		
<i>Oocystis</i> sp.	18.1	3.90
<i>Staurastrum paradoxum</i>	1.5	0.31
<i>Cosmarium</i> sp.	3.2	0.68
<i>Scenedesmus bijuga</i>	1.2	0.25
<i>Sphaerocystis schroeteri</i>	15.0	3.22
Total		8.39
CYANOPHYCEAE		
<i>Oscillatoria limnetica</i>	12.8	2.14
<i>Merismopedia</i> sp.	7.5	1.61
<i>Anabaena</i> sp.	6.8	1.47
Total		5.84
CRYPTOPHYCEAE		
<i>Katablepharis ovalis</i>	5.5	1.19
<i>Cryptomonas erosa</i>	68.7	14.79
<i>Rhodomonas minuta</i>	64.3	13.86
<i>Cryptomonas curvata</i>	1.3	0.28
Total		30.13
DINOPHYCEAE		
<i>Glenodinium</i> sp.	1.6	1.64
<i>Ceratium hirundinella</i>	3.9	0.84
<i>Peridinium aciculiferum</i>	42.0	9.04
<i>Peridinium cinctum</i>	5.0	1.08
<i>Gymnodinium helveticum</i>	16.2	3.48
Total		16.10
Total		72.15

Table 11. Dominant diatom species from 1986 to 1992 in Lake Ontario.

			% of total biomass	% of total abundance
1986	<i>Stephanodiscus alpinus</i>	16.3	0.13	
	<i>Tabellaria flocculosa</i>	5.4	0.31	
	<i>Fragillaria crotonensis</i>	2.9	0.68	
	<i>Fragillaria capucina</i>	0.9	0.43	
	<i>Aulacoseira islandica</i>	1.8	0.36	
1987	<i>Aulacoseira islandica</i>	16.1	2.69	
	<i>Stephanodiscus binderanus</i>	7.1	2.25	
	<i>Tabellaria flocculosa</i>	6.3	0.37	
	<i>Stephanodiscus alpinus</i>	4.9	0.19	
1988	<i>Stephanodiscus alpinus</i>	9.6	0.27	
	<i>Aulacoseira islandica</i>	9.0	1.00	
	<i>Tabellaria flocculosa</i>	6.8	0.31	
	<i>Fragillaria crotonensis</i>	2.0	0.31	
	<i>Stephanodiscus binderanus</i>	1.1	0.41	
1989	No spring data			
1990	<i>Aulacoseira islandica</i>	26.6	5.63	
	<i>Stephanodiscus alpinus</i>	3.3	0.23	
	<i>Fragillaria crotonensis</i>	2.4	0.91	
	<i>Stephanodiscus binderanus</i>	2.0	0.69	
1991	<i>Aulacoseira islandica</i>	17.8	2.92	
	<i>Fragillaria crotonensis</i>	7.4	1.7	
	<i>Stephanodiscus alpinus</i>	1.9	0.08	
	<i>Stephanodiscus par-us</i>	0.14	0.55	
1992	<i>Aulacoseira islandica</i>	43.8	12.8	
	<i>Stephanodiscus binderanus</i>	9.5	3.8	
	<i>Tabellaria flocculosa</i>	1.0	6.0	
	<i>Stephanodiscus hantzschii</i>	0.54	0.19	

Table 12. Spring and summer biomass of selected Lake Ontario phytoplankton species for the period 1972 to 1992. NS = no sample, ND = no data. 1972 data from Munawar *et al.* (1975). 1981 and 1982 data from Johansson *et al.* (1985).

		1972	1981	1982	1986	1987	1988	1989	1990	1991	1992
		Mean Biomass ($\mu\text{g}/\text{m}^3$)									
SPRING (April)											
<i>Actinocyclus normanii</i>	BAC	ND	ND	ND	583	6,544	0	NS	230	0	0
<i>Asterionella formosa</i>	BAC	ND	5,166	ND	2,390	1,754	6,549	NS	14,171	1,955	15,073
<i>Aulacoseira islandica</i>	BAC	68,425	138,310	57,008	8,573	149,632	46,209	NS	431,534	164,590	442,812
<i>Cyclotella ocellata</i>	BAC	ND	ND	ND	0	0	20	NS	63	221	0
<i>Cymatopleura solea</i>	BAC	ND	1,835	ND	1,874	407	2,312	NS	5,134	7,795	38,277
<i>Diatoma tenuue</i>	BAC	ND	ND	ND	51	1,439	1,933	NS	4,337	487	5,496
<i>Fragilaria crotonensis</i>	BAC	ND	813	221	4,298	18,097	7,347	NS	11,849	9,661	6,687
<i>Stephanodiscus alpinus</i>	BAC	83,300*	106,979*	2,063*	133,353	45,667	41,387	NS	52,681	16,380	15,197
<i>Stephanodiscus binderanus</i>	BAC	ND	132,606	9,903	1,572	65,157	6,578	NS	30,515	8,226	96,273
<i>Stephanodiscus hantzschii</i>	BAC	ND	3,878	2,194	647	1,171	1,269	NS	843	455	1,949
<i>Stephanodiscus niagarae</i>	BAC	ND	30,461	ND	1,269	35,235	11,725	NS	5,610	2,487	0
<i>Stephanodiscus parvus</i>	BAC	ND	ND	ND	0	98	3	NS	198	1,086	445
<i>S. transsilvanicus</i>	BAC	ND	ND	ND	0	6,325	0	NS	2,279	975	6,375
<i>Tahellaria flocculosa</i>	BAC	ND	ND	ND	7,043	45,014	47,896	NS	23,611	20,349	60,623
<i>Ankistrodesmus falcatus</i>	CHL	ND	ND	ND	0	0	0	NS	616	1,422	2,584
<i>Ankistrodesmus gracilis</i>	CHL	ND	ND	ND	0	19	0	NS	0	1,048	1,342
<i>Chlamydomonas</i> sp.	CHL	ND	ND	ND	961	511	131	NS	1,742	2,040	2,966
<i>Cryptomonas erosa</i>	CRY	ND	18,313	13,649	28,998	24,457	42,770	NS	27,053	34,100	40,444
<i>Gymnodinium</i> spp.	PYR	89,250	62,254	24,702	8,803	40,579	34,600	NS	66,808	17,717	14,201
SUMMER (August)											
<i>Cyclotella ocellata</i>	BAC	ND	ND	ND	0	0.5	68	38	76	229	0
<i>Gymnodinium</i> spp.	PYR	96,900	ND	11,430	3,904	217	2,324	9,321	15,988	2,362	NS
<i>Ceratium hirundinella</i>	PYR	ND	39,460	6,108	68,576	0	86,433	31,558	9,952	0	NS
<i>Peridinium</i> spp.	PYR	114,000	160,542	64,556	8,338	0	11,300	116,726	47,439	29,523	NS
<i>Rhodomonas minuta</i>	CRY	79,800	100,230	86,433	24,896	9,684	20,593	49,444	22,321	28,647	NS

*Identified as *Stephanodiscus astrea*, probably equivalent to *S. alpinus*.

Table 13. Distribution of indicator diatom species in Lake Ontario. The classification scheme of Tarapchak and Stoermer (1976) was utilized except in the case of Surirella angusta. S. angusta was classified as eutrophic following Wolin et al. (1991). M1 = mesotrophic but intolerant of nutrient enrichment, M2 = mesotrophic and tolerant of moderate nutrient enrichment, E = eutrophic. 1970, 1981/82 and 1986/87 data are from Munawar et al. (1974), and Johannsson et al. (1985a and b), this study, respectively. The 1986 to 1992 data are from this study. Values in the columns M1, M2 and E represent April and late July in 1972. In 1981, 1982 and 1986 to 1992 April and August values are used in the calculation. There are no April dates in 1989 and no August dates in 1992. Only diatoms contributing > 5% of the biomass of a sampling date were classified.

	M1	M2	E	M1+M2/E
1970	1	1	2	1.0
1981	1	5	4	1.5
1982	1	4	4	1.3
1986	2	2	3	1.3
1987	3	2	2	2.5
1988	3	3	2	3.0
1989	0	1	0	---
1990	2	3	2	2.5
1991	3	2	2	2.5
1992	2	1	1	3.0

Table 14. Number of species and genera observed in each phylum of zooplankton, Lake Ontario 1986 to 1992. ZM = veligers of *Dreissena polymorpha*.

Number of Species

	1986	1987	1988	1989	1990	1991	1992	1986-92
Calanoida	7	8	6	4	7	6	3	8
Cladocera	8	10	10	7	11	9	3	15
Cyclopoida	1	2	1	2	3	2	2	3
Mysidacea	1	0	0	0	1	1	0	1
Rotifera	27	29	26	25	28	21	16	37
ZM	0	0	1	0	1	0	0	1
TOTAL	44	49	44	38	51	39	24	65

Number of Genera

	1986	1987	1988	1989	1990	1991	1992	1986-92
Calanoida	3	4	3	4	5	3	2	5
Cladocera	7	3	8	6	8	7	3	10
Cyclopoida	2	2	2	3	3	2	2	3
Mysidacea	1	0	0	0	1	1	0	1
Rotifera	14	11	13	14	16	12	10	18
ZM	0	0	1	0	1	0	0	1
TOTAL	27	20	27	27	34	25	17	38

Table 15. Summary of common zooplankton species occurrence in Lake Ontario during 1986 to 1992. Species were arbitrarily classified as common if they accounted for $\geq 0.1\%$ of the total abundance or $\geq 1.0\%$ of the total biomass, with the exception of rotifers. Rotifer species were considered common if they accounted for $\geq 1.0\%$ of the total abundance.

TAXON	MAXIMUM DENSITY (#/m ³)	AVERAGE DENSITY (#/m ³)	% OF TOTAL ABUNDANCE	MEAN BIOMASS (μ g/m ³)	% OF TOTAL BIOMASS
COPEPODA					
Copepoda - nauplii	203,920	36.667.0	15.56	14,667	16.25
Cyclopoida					
Cyclopoid - copepodite	112,288	18,114.5	7.69	12,695	14.07
<i>Cyclops bicuspis</i> datus thomasi	32,124	4.136.8	1.76	15,019	16.64
<i>Cyclops vernalis</i>	10,751	456.1	0.19	388	0.43
Tropocyclops - copepodite	35,904	965.0	0.41	363	0.40
<i>Tropocyclops prasinus mexicanus</i>	7.715	583.8	0.25	683	0.76
Calanoida					
Diaptomus - copepodite	8,295	837.1	0.36	1,040	1.15
<i>Limnocalanus macrurus</i>	2,077	43.1	0.02	1,165	1.29
	Total		26.22		50.99
CLADOCERA					
<i>Bosmina longirostris</i>	236,790	12.990.4	5.51	9,421	10.44
<i>Ceriodaphnia</i> sp.	15,430	460.5	0.20	690	0.77
<i>Daphnia galaeta mendotae</i>	41,633	1.139.0	0.48	4,036	4.47
<i>Daphnia retrocurva</i>	131,895	7,120.8	3.02	20,483	22.70
	Total		9.21		38.37
ROTIFERA					
<i>Ascomorpha ovalis</i>	44,123	3.427.8	1.45	58	0.06
<i>Conochilus unicornis</i>	63,563	3,996.5	1.70	70	0.08
<i>Kellicottia longispina</i>	103,596	9,898.0	4.20	117	0.13
<i>Keratella cochlearis</i>	260,688	26,973.0	11.44	100	0.11
<i>Keratella crassa</i>	114,292	17,757.8	7.53	941	1.04
<i>Keratella earlinae</i>	134,493	7,417.5	3.15	198	0.22
<i>Keratella quadrata</i>	36,999	2,528.6	1.07	192	0.21
<i>Polyarthra major</i>	215,839	17,613.3	7.47	1,984	2.20
<i>Polyarthra remata</i>	36,207	2,363.5	1.00	27	0.03
<i>Polyarthra vulgaris</i>	290,925	45,216.8	19.19	2,034	2.25
<i>Pompholyx sulcata</i>	170,137	2,930.2	1.24	38	0.04
<i>Synchaeta</i> sp.	62,904	3,731.4	1.58	107	0.12
<i>Trichocerca multicrinis</i>	28,620	2,630.3	1.12	124	0.14
	Total		62.15		6.64
			=====		=====
	Total		97.59		96.01

Table 16. Time trends in zooplankton biomass and abundance of selected phyla in Lake Ontario, 1986 - 1992 (spring and summer data only). ND = no data, * * weighted mean that considers the number of stations sampled each year.

BIOMASS (µg/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	µg/L	%	µg/L	%	µg/L	%	µg/L	%	µg/L	%	
1986	3.7	4.1	21.7	23.6	18.6	20.2	36.5	39.8	11.0	12.0	91.8
1987	3.2	6.2	19.8	39.2	10.7	21.2	10.9	21.5	6.0	11.8	50.5
1988	4.6	5.6	26.9	32.7	15.0	18.2	28.5	34.6	7.3	8.9	82.3
1989 ^a	3.5	2.6	55.3	40.6	22.1	16.3	42.9	31.5	12.3	9.0	136.0
1990	2.5	4.5	6.2	11.1	17.8	31.6	25.5	45.3	4.2	7.5	56.3
1991	5.6	3.4	105.1	63.3	10.8	6.5	41.8	25.1	2.8	1.7	166.2
1992	1.1	7.4	0.1	0.6	1.4	9.2	12.4	81.8	0.1	1.0	15.1
1986-92	3.8	4.2	36.1	40.0	14.7	16.3	29.2	32.3	6.5	7.2	90.2**

ABUNDANCE (number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	
1986	1.2	0.4	19.9	6.8	46.5	15.9	20.1	6.9	204.7	70.0	292.4
1987	2.1	1.3	12.1	7.9	26.8	17.4	12.6	8.2	100.6	65.2	154.2
1988	1.1	0.4	42.4	13.6	37.6	12.1	27.6	8.9	201.9	65.0	310.7
1989 ^a	1.0	0.2	53.1	12.6	55.3	13.1	46.1	10.9	266.9	63.2	422.4
1990	0.9	0.4	2.1	1.0	44.5	21.3	23.6	11.3	138.1	66.0	209.3
1991	1.6	0.9	23.9	13.8	27.1	15.6	31.0	17.9	89.9	51.9	173.3
1992	0.3	2.0	0.0	0.1	3.5	21.4	6.1	37.5	6.3	38.9	16.2
1986-92	1.3	0.5	22.1	9.4	36.7	15.6	24.3	10.3	151.4	64.2	235.7**

^a Summer data only. No spring samples were collected.

Table 17. Time trends in zooplankton biomass and abundance of zooplankton groups in Lake Ontario, 1986 - 1992 (spring data only). ND = no data, ** weighted mean that considers the number of stations sampled each year. NS = no spring samples collected in 1989. Copepoda = nauplius stage of the Copepoda.

SPRING BIOMASS ($\mu\text{g/L}$)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	I d -	%	I-M-	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$
1986	1.3	28.5	0.0003	0.007	1.0	21.6	2.2	47.2	0.04	0.8	4.6
1987	2.2	26.9	0.02	0.3	2.6	32.1	2.9	36.3	0.35	4.4	8.1
1988	1.5	12.7	0.02	0.2	1.6	12.9	8.8	72.9	0.15	1.3	12.1
1989	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1990	2.2	21.7	0.02	0.2	1.4	13.5	6.3	62.1	0.22	2.2	10.1
1991	2.8	24.9	0.04	0.3	1.7	15.2	6.6	58.2	0.07	0.6	11.3
1992	1.1	7.4	0.09	0.6	1.4	9.2	12.4	81.8	0.15	1.0	15.1
1986-92	1.9	19.7	0.03	0.3	1.6	16.6	6.0	61.4	0.17	1.7	9.8**

SPRING ABUNDANCE (number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	#/L
1986	0.3	6.3	0.0002	0.003	2.5	46.3	1.0	19.6	1.5	27.8	5.3
1987	0.8	3.6	0.01	0.04	6.5	28.7	1.4	6.3	13.8	61.3	22.5
1988	0.6	4.4	0.02	0.10	3.9	28.4	3.6	25.8	5.7	41.2	13.8
1989	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1990	0.6	3.7	0.01	0.04	3.4	22.9	2.4	15.9	8.6	57.5	15.0
1991	0.5	5.1	0.01	0.10	4.3	41.1	2.8	27.2	2.8	26.5	10.4
1992	0.3	2.0	0.02	0.10	3.5	21.4	6.1	37.5	6.3	38.9	16.2
1986-92	0.5	4.0	0.01	0.10	4.1	29.7	2.6	19.0	6.5	47.2	13.7**

Table 18. Time trends in zooplankton biomass and abundance of selected phyla in Lake Ontario, 1986 - 1992 (summer data only). ND = no data, ** weighted mean that considers the number of stations sampled each year. NS = no summer sample collected in 1992.

SUMMER BIOMASS ($\mu\text{g/L}$)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	I d -	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	
1986	6.1	3.4	43.3	24.2	36.2	20.2	70.9	39.6	22.0	12.3	179.1
1987	4.1	4.4	39.6	42.6	18.8	20.3	18.8	20.2	11.6	12.5	92.9
1988	7.7	5.1	53.8	35.3	28.5	18.7	48.1	31.5	14.5	9.5	152.5
1989	3.5	2.6	55.3	40.6	22.1	16.3	42.9	31.5	12.3	9.0	136.0
1990	2.8	2.8	12.5	12.2	34.2	33.4	44.7	43.7	8.2	8.0	102.5
1991	8.5	2.6	210.2	65.5	19.9	6.2	77.0	24.0	5.5	1.7	321.1
1992	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1986-92	5.5	3.3	69.1	42.1	26.6	16.2	50.4	30.7	12.3	7.5	164.0**

SUMMER ABUNDANCE (number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	
1986	2.1	0.4	39.8	6.9	90.5	15.6	39.1	6.8	408.0	70.4	579.4
1987	3.3	1.2	24.3	8.5	47.1	16.5	23.9	8.3	187.5	65.6	286.0
1988	1.6	0.0	84.8	14.0	71.2	11.7	51.7	8.5	398.2	65.5	607.5
1989	1.0	0.2	53.1	12.6	55.3	13.1	46.1	10.9	266.9	63.2	422.4
1990	1.2	0.3	4.2	1.0	85.6	21.2	44.9	11.1	267.5	66.3	403.7
1991	2.6	0.8	47.8	14.2	49.8	14.8	59.1	17.6	177.0	52.6	336.2
1992	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1986-92	2.0	0.5	42.3	9.6	66.6	15.2	44.1	10.0	284.2	64.7	439.2**

Table 19. Mean spring abundance (#/m³) for selected Crustacea species. 1981 and 1982 data is from Johannson *et al.* (1985b). Note there were no spring samples taken in 1989.

Taxon	Group	1981 (#/m ³)	1982 (#/m ³)	1986 (#/m ³)	1987 (#/m ³)	1988 (#/m ³)	1990 (#/m ³)	1991 (#/m ³)
Eurytemora affinis	CAL	0	0	0	0	0	0	0
Diaptomus minutus	CAL	0	0	1	1	4	1	12
Diaptomus oregonensis	CAL	6	1	59	50	53	35	37
Diaptomus sicilis	CAL	21	13	97	73	68	134	146
Limnocalanus macrurus	CAL	2	2	8	20	13	21	27
Calanoid - copepodite	CAL	102	33	171	675	462	364	309
Copepoda - nauplii	COP	491	332	2,471	6,469	3,918	3,418	4,286
Tropocyclops prasinus mexicanus	CYC	25	29	22	14	14	14	23
Cyclops bicuspidatus thomasi	CYC	613	494	345	555	1,598	1,147	1,221
Cyclopoid - copepodite	CYC	389	652	669	852	1,950	1,214	1,587

Table 20. Comparison of abundance of selected species of Crustacea for the sampling period in August of 1970 (Watson and Carpenter 1974), 1972 (McNaught et al. 1975), 1981, 1982 (Station 12 and 41 only) Johannsson et al. 1985b) and 1986 to 1991 August data are reported. Values are #/m³. Values in 1970, 1972, 1981, and 1982 are not corrected for filtration efficiency. Values in parentheses are depths of tow. NC= not counted.

	1970 (0-50m)	1972 (0-5m)	1981 (0-20m)	1982 (0-20m)	1986 (0-20m)	1987 (0-20m)	1988 (0-20m)	1989 (0-20m)	1990 (0-20m)	1991 (0-20m)
Cladocera										
<i>Bosmina longirostris</i>	19, 210	63, 691	82, 930	141, 914	24, 067	4, 873	72, 640	40, 033	666	7, 081
<i>Bythotrephes cederstroemi</i>	0	0	0	0	0	0	0	0	4	
<i>Eubosmina coregoni</i>	306	1, 453	200	50	197	388	32	158	123	331
<i>Daphnia retrocurva</i>	6, 868**	11, 965	5, 250	814	13, 788	9, 528	11, 584	8, 116	2, 694	36, 187
<i>Daphnia longiremis</i>	0	9	11	0	0	4	0	7	0	
<i>Daphnia galateata mendotae</i>	99	0	0	165	9, 228	87	105	2	3509	
<i>Ceriodaphnia lacustris</i>	448	4, 202	2, 962	1, 452	1, 323	119	314	0	0	0
<i>Polyphemus pediculus</i>	0	3	4	29	43	37	19	0	103	42
<i>Holopedium gibberum</i>	0	7	0	0	61	0	0	19	103	197
<i>Leptodora kindtii</i>	98	0	8	0	108	34	81	88	55	135
Cyclopoida										
<i>Cyclops bicuspis</i> datus										
<i>thomasi</i>	3, 371	12, 113	8, 771	2, 497	5, 574	2, 292	6, 698	4, 672	8, 287	12, 785
<i>Cyclops vernalis</i>	616	643	0	6	0	1, 345	0	0	8	5, 232
<i>Tropocyclops prasinus</i>										
<i>mexicanus</i>	548	3, 510	485	255	429	2, 141	132	2, 284	376	1, 378
<i>Mesocyclops edax</i>	207	NC	0	11	0	0	0	4	32	0
<i>Cyclopoid copepodites</i>	21, 316	29, 143	34, 629	20, 840	32, 264	18, 088	44, 883	39, 069	36, 176	41, 063
<i>Copepoda nauplii</i>	NC	NC	8, 719	14, 275	90, 469	47, 064	71, 187	55, 268	85, 567	49, 825
Calanoida										
<i>Diaptomus minutus</i>	204	74	0	0	0	7	0	0	17	80
<i>Diaptomus sicilis</i>	60***	17	0	0	15	0	45	8	33	403
<i>Diaptomus oregonensis</i>										
108	21	0	271	174	75	88	147	144		
<i>Limnocalanus macrurus</i>	185	6	0	100	17	178	46	25	41	
<i>Calanoid copepodites</i>	725	116	82	215	1, 371	2, 681	1, 287	257	895	1, 317
<i>Eurytemora affinis</i>	401	0	0	22	352*	377'	63*	333*	88*	16*

* Includes Copepodites of *Eurytemora* sp.

"*Daphnia* spp.

***D. sicilis plus D. oregonensis